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TITLE: Composite sheet e.g. for wiper cloth, dust cloth - has predetermined extension percentage when subjected to tension test along vertical and horizontal directions

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JP 10140458A	November 14, 1996	1996JP-0302787	
US 6080466A	November 12, 1997	1997US-0968117	

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ABSTRACTED-PUB-NO: JP 10140458A

BASIC-ABSTRACT:

The sheet is formed by tangling pulp fibres which includes thermoplastic continuous filament. The extension percentage, when subjected to tension test along vertical and horizontal directions, is 50-100%. The aspect ratio of the extension percentage is 0.8-1.25%.

ADVANTAGE - The sheet excels in drape feeling, improves versatility, improves flexibility, maintains superior characteristics of coexistence of absorption property.

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EQUIVALENT-ABSTRACTS:

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CHOSEN-DRAWING: Dwg. 0/0

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TITLE-TERMS: COMPOSITE SHEET WIFE CLOTH DUST CLOTH PREDETERMINED EXTEND PERCENTAGE
SUBJECT TENSION TEST VERTICAL HORIZONTAL DIRECTION

DERWENT-CLASS. F04 P28 P73

CPI-CODES: F02-C01; F03-K02; F04-E; F04-F03;

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CLAIMS

[Claim(s)]

[Claim 1] The compound sheet with which crepe processing is made, and each pace of expansion at the time of the tension test of lengthwise [after processing] and a longitudinal direction is 100% or less 50% or more in the compound sheet which carried out the stream confounding of the pulp fiber to the web which consists of a thermoplastic continuous filament, and the aspect ratio of the pace of expansion has or more 0.8 1.25 or less value.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the compound sheet which can be suitably used as an industrial use wiper, a waste, a counter cross, a dishcloth, a dustcloth, etc.

[0002]

[Description of the Prior Art] as the conventional technology of a compound sheet in which the stream confounding of the pulp fiber was carried out to the continuous filament -- JP,5-179545,A "nonwoven compound cloth with high pulp content", and JP,5-214654,A "-- it wipes and there is manufacturing method" of cloth etc. These invention is what conquered the on-the-strength fall at the time of the humidity which is the fault of a wood pulp fiber sheet by composite-ization with a continuous-filament web, and it can be called the outstanding technology in a wiper field. With such technology, the high wet strength was given maintaining performances, such as coexistence of the water absorption and oil-absorption nature which was excellent in the wiper made of paper and which is the feature, and a low cost, and the same use as the wiper made of cloth was attained

[0003] however, the continuous-filament web which can be used when putting these in practical use -- the span bond nonwoven fabric of points, such as cost and intensity, to low eyes (below 20g[m] 2) -- ***** -- a thing is the actual condition Fiber orientation inclined remarkably and, as for the span bond nonwoven fabric of low eyes, the most has turned to lengthwise. Consequently, the big difference in tensile strength and a pace of expansion in every direction only by composite-izing pulp fiber and a span bond nonwoven fabric by the stream confounding will arise

[0004] The anisotropy [made from the complex of a commercial span bond nonwoven fabric and pulp fiber] in every direction as wiped and shown in Table -1 also with cloth exists. This table performs the tension test of lengthwise and a longitudinal direction, and measures the pace of expansion of the time of a breaking load and fracture. It is the direction where lengthwise [in this case] is parallel to the line of a flow direction attached by stream confounding processing. When a measurement result is seen, in a breaking load, lengthwise is [longitudinal direction / article / marketing / both] / high more than double precision, and a longitudinal direction is high 1.9 or more times compared with lengthwise by the pace of expansion. These anisotropies have big influence on the feeling of use under wiping work, although the basic performance as a wiper is not affected (water absorption and oil-absorption nature, wiping nature, etc.). The feature of these products is in the point that intensity is high compared with the wiper made of paper, and it can be equal also to the same excessive wiping work as the wiper made of cloth.

[0005] However, when an anisotropy exists in all directions [of a sheet] and a difference is especially in elongation, an operator will sense strong sense of incongruity with the wiper made of cloth, and will hold strong resistance to using it similarly. Since it is simply torn by the small material of elongation, you have to stop for example, having to use it for the directivity of a wiper carefully for it, if a metal projection etc. is in a wiping object.

[0006] Moreover, the commercial elegance of the above-mentioned (Table -1) is lacking in drape nature (ductility, flexibility), and its difference with the wiper made of cloth is large in respect of a feel. There is a product using staple fibers, such as man-made fiber, rayon (a polyester fiber, a polypropylene fiber, nylon fiber, acrylic fiber, etc.), and a cotton, in the stream confounding nonwoven fabric which has the drape nature near cloth. Although these fiber had the good point which the strength of chewiness like paper does not produce when combination between fiber sheet-ized weakly compared with pulp fiber, since the price was high, it could not become a waste substitute made of cloth.

[0007]

[Problem(s) to be Solved by the Invention] While this invention improves the fault which the compound sheet which consists of such a conventional span bond nonwoven fabric and conventional pulp fiber has, and excelling in a feeling of a drape and acquiring the feel very near the product made of cloth, user-friendliness is well made for the purpose of a cheap compound sheet.

[0008]

[Means for Solving the Problem] As a result of inquiring wholeheartedly to such a fault, this invention persons were performing crepe processing to the compound sheet which carried out the stream confounding of the pulp fiber to the web which consists of a thermoplastic filament, and raising a lengthwise pace of expansion to it to the same extent as a longitudinal direction, found out that the same feeling of use as the wiper made of cloth was obtained, and resulted in this invention.

[0009]

[Function] Crepe processing is processing which attaches a silk crepe-like wrinkle to a compound sheet, and a lengthwise pace of

expansion can be raised by giving this wrinkle so that a lengthwise size may be shortened. Pulp fiber holds many hydroxyl groups in the front face and interior. By mutual combination of this hydroxyl group, the compound sheet before crepe processing is carrying out a character like paper with strong (stiffness is high) chewiness. Crepe processing not only increases a lengthwise pace of expansion, but destroys the hydrogen bond between pulp fiber and inside pulp fiber. Consequently, the strength of the chewiness of a compound sheet is lost and a character like flexible and pliant cloth is acquired.

[0010] Although crepe processing is general technology in manufacture of tissue paper or a paper towel, the purpose is only in grant of flexibility. The first purpose of the crepe processing in this invention is in an improvement of elongation, and these points differ. Moreover, neither tissue paper nor a paper towel can be used on a par with ***** made of cloth like [wet intensity is very low and] this invention which used the continuous filament.

[0011]

[The form of invention implementation] As for the compound sheet in this invention which carries out crepe processing, it is desirable to carry out the stream confounding of the pulp fiber to the web which consists of a thermoplastic continuous filament, and to use pulp fiber as main materials. Especially the thing that used coniferous wood as the raw material as pulp fiber which is a main material is desirable, and non-** or bleached-pulp fiber manufactured by digester processes, such as a kraft process, the ape fight method, the soda method, the polysulfide method, the BAJARU fight method, and the solvolysis method, can be used. Moreover, it is possible to blend a part of non-** which manufactured the broad-leaved tree by the digester process same as a raw material, or bleached-pulp fiber. Since fiber length of a hardwood pulp is short compared with needle-leaf tree pulp, if 50% or less of loadings are desirable and are blended more than this to the total amount of pulp fiber, it will have a bad influence on confounding nature. Some which can be used as a pulp fiber raw material in addition to wood have cotton, flax, a kenaf, a jute, Manila hemp, a bagasse, straw, an esparto, a bamboo, etc. These can be used as a substitute of needle-leaf tree pulp and a hardwood pulp according to fiber length.

[0012] It is required to have the moderate opening structure which can carry out a confounding to pulp fiber, and, for the fineness of a continuous filament, the basis weight of a web is [a continuous-fiber filament web] 5 - 30 g/m² at 0.5-5 deniers. It is a thing, and especially, fineness is 1-3 deniers and a basis weight is 10 - 20 g/m². A thing is desirable. For example, in the case of the span bond nonwoven fabric made from polypropylene with a fineness of 2 deniers, a basis weight is 20 g/m². If it exceeds, a fiber gap will decrease, and it is 10 g/m² conversely. If less, an opening will become large too much and, in a gap, a confounding will not go well. When 5 deniers is exceeded, a filament becomes upright and it stops being suitable for crepe processing, although the rate of an opening will increase and the basis weight of a web will be raised, if the fineness of a filament is raised. When less than 0.5 deniers, the intensity of the continuous filament itself running short and web-izing stop conversely, being suitable from a bird clapper difficult, although moderate opening structure can be maintained also by the web of a low basis weight if fineness is lowered.

[0013] In addition, as a continuous-filament web, rayon system fiber, POREORE fin system fiber, a polyamide fiber, a polyester fiber, polyacrylic-acid system fiber, etc. can be used.

[0014] The method of piling up the pulp fiber sheet obtained by wet or dry type on the continuous-filament web, blowing off and performing a water column style from on the, is suitable for a stream confounding. The pulp fiber sheet in this case needs for combination between fiber to loosen at the time of stream confounding processing, and to separate fiber separately. When a pulp fiber sheet is manufactured with especially wet, the combination between the fiber after dryness is quite high. Therefore, use of the chemical which raises bonding strength between fiber, such as a paper reinforcing agent, to this pulp fiber sheet is not desirable. On the contrary, although the chemicals (surfactant etc.) which weaken the bonding strength between fiber are usable in the range from which sheet-ization of pulp fiber is not prevented, even if a chemical is additive-free, it does not interfere at all. It is [separation of fiber] easier to be higher as much as possible, although the moisture in a pulp fiber sheet can be set up suitably.

[0015] It wipes and the basis weight of a pulp fiber sheet can be suitably set up according to the performance of cloth. When it wipes and thinks on the basis of the performance of cloth, a part for the pulp fiber in a compound sheet is 20 g/m². It is desirable that it is above. It will wipe, if less than this value, and the absorptivity as cloth is inferior. however -- since a stream confounding can process [the processing which piles up several pulp fiber sheets, and] two or more pulp fiber sheets in piles further on a compound sheet -- a pulp fiber sheet -- a sheet -- if it is more than the basis weight [-izing / a basis weight], it will not matter the confounding of pulp fiber and a continuous-filament web -- a water column style -- a pulp fiber layer -- penetrating -- a continuous-filament layer -- reaching -- in addition -- and the layer is also penetrated and it realizes for the first time. Therefore, if the basis weight of a pulp fiber sheet becomes high, a water column style will stop reaching a continuous-filament layer, and a confounding will become impossible.

[0016] the nozzle of water pressure, a stream nozzle aperture, and the cross direction -- the number of a hole, and the nozzle of a flow direction -- confounding conditions, such as the number of trains of a hole and line speed, can be suitably chosen according to a required confounding degree. Confounding conditions are not restrained from the field of crepe processing.

[0017] Both are possible although there are wet and dry type in crepe processing. Since it is regularly used by manufacture of tissue or a paper towel and processing is performed simultaneously with dryness, wet crepe processing in which the Yankee dryer was used is convenient. Moreover, even when a Yankee dryer cannot be chosen, crepe processing is possible at dry type.

[0018] What is necessary is just to choose the conditions of crepe processing according to the size of the aspect ratio before processing. If crepe processing is performed, the lengthwise size of a compound sheet will be shrunken, and if there are many amounts of this shrinkage, the pace of expansion after processing will become high. This amount is determined by control of the line speed of a compound sheet. When speed in case a compound sheet goes into a crepe processor is set to S0, the more it makes

speed S_1 when coming out of a crepe processor smaller than S_0 , it is shrunken, an amount becomes large and, the more a high pace of expansion is obtained. It is called the compressibility of crepe processing of the speed difference at this time. Compressibility is expressed with the following formula.

$$\text{Compressibility} = (S_0 - S_1) / S_0 \times 100 [\%]$$

[0019] It is suitable for each pace of expansion at the time of the tension test of lengthwise [after processing] and a longitudinal direction to be 100% or less 50% or more, and to make it the aspect ratio of the pace of expansion become 1.25 or less value 0.8% or more by this crepe processing.

[0020] When the pace of expansion at the time of the tension test of lengthwise [after crepe processing] and a longitudinal direction is less than 50%, elongation sufficient by the force of a grade in which it is added at the time of wiping work is not acquired, and it does not become the feeling of use like the waste made of cloth. Although it is necessary to set up the compressibility of crepe processing to 50% or more in order for a pace of expansion to exceed 100%, now, the shrinkage of the original fabric by crepe processing is large, and remarkably uneconomical.

[0021] Although an anisotropy in every direction appears in breaking strength, a pace of expansion, etc., the anisotropy of a pace of expansion is important on a feeling of use. To not producing fracture, if the force more than breaking strength is not added, elongation will be produced, whenever the force is added, even if it is not strong force like breaking strength. Therefore, the anisotropy of elongation is immediately perceived at the time of wiping work. If it becomes the value which an aspect ratio is less than 0.8 (when the pace of expansion of the larger one is computed by having made it into the denominator), or exceeds 1.25 (when a small pace of expansion is computed by having made it into the denominator) when an anisotropy is expressed with an aspect ratio, existence of an anisotropy will be perceived clearly.

[0022]

[Example]

The continuous-glass-fiber nonwoven fabric with many point weld zones where the example 1 polypropylene continuous glass fiber was accumulated, and it became, and self welding of between [this] polypropylene continuous glass fibers was carried out was prepared. the fineness of the polypropylene continuous glass fiber which constitutes this continuous-glass-fiber nonwoven fabric -- 2.5 deniers -- it is -- the basis weight of a continuous-glass-fiber nonwoven fabric -- 15 g/m² it was . The laminating of the paper sheet which does not contain any fiber other than pulp fiber was carried out to the front face of this continuous-glass-fiber nonwoven fabric. this paper sheet -- JIS the basis weight measured by the method shown to SP8124 -- 90g/m² it was . In addition, this paper sheet is the object with which Canada standard freeness carried out wet paper making of the ***** kraft pulp fiber which is 650ml, and was obtained. And paper was located upwards, and as it was located downward, the continuous-glass-fiber nonwoven fabric carried out the laminating, and placed on the transfer conveyer. subsequently -- while making a layered product transport by this conveyer -- the nozzle of 0.1mm of apertures -- the high-pressure water column style blow off with which the hole is located in a line at intervals of 0.6mm -- using -- 50 kg/cm² make a high-pressure water column style blow off with water pressure -- as it penetrated at the tooth back of a continuous-glass-fiber nonwoven fabric from the front face of a paper sheet, the high-pressure water column style was given. The nozzles which processing took are six trains in all. After the confounding was dried with the cylinder dryer. The nonwoven fabric sheet in which pulp fiber and the polypropylene fiber carried out the confounding as mentioned above was obtained. Dry type crepe processing was carried out for this nonwoven fabric sheet by the U.S. country Mike Rex micro clay par. Speed 25 m/min and the temperature of 63 degrees C, conditions are forced and are ** 60psi, a blade configuration flat, and 20% of compressibility.

[0023] Except the compressibility of example 2 dry-type crepe processing being 15%, it carried out on the same conditions as an example 1.

[0024] It is the pressure of 12 g/m² and a high-pressure water column style in the basis weight of example 3 ***** kraft pulp about the basis weight of 38 g/m² and a continuous-glass-fiber nonwoven fabric 40 kg/cm². The nonwoven fabric sheet was manufactured on the same conditions as an example 1 except having carried out. Dry type crepe processing was also carried out on the same conditions as an example 1.

[0025] Except the compressibility of example 4 dry-type crepe processing being 15%, it carried out on the same conditions as an example 3.

[0026] The sheet which is not carrying out dry type crepe processing on the same manufacture conditions as example of comparison 1 example 1

[0027] The sheet which is not carrying out dry type crepe processing on the same manufacture conditions as example of comparison 2 example 2.

[0028] Measurement of each physical-properties value of following the (1) - (5) in [examining method] Table -1 and -2 is JISP. It carried out under the standard conditions (temperature of 20**2 degrees C, 65**2% of humidity) specified by 8111. Each sample was pretreated for 4 hours or more based on this convention.

[0029] (1) Basis weight JIS P It measured according to 8124.

[0030] (2) Thickness JIS P It measured according to 8118.

[0031] (3) The tension test was carried out on condition that the tension test following.

Testing machine Cage en tick incorporated company make Tensilon radiographic-500 type speed of testing Width of face of 50 mm/min test piece 30mm span length 180mm. [0032] (4) The Clark rigidity examining method JIS P It measured according to 8143.

[0033] (5) Carry out the ten-sheet laminating of the test piece of the square of water absorption and 5cm of oil-absorption nature pieces, and fix four corners with a stapler (part number : No.10-1M Max Co., Ltd. make of a needle). When it floated on the tap water or machine oil which filled this to the 500ml beaker and a test piece touched an oil level, time until it sinks in the bottom of an oil level from from was measured, and it considered as water absorption and oil-absorption speed. the weight of the staple used at this time -- 0.986g per 50 pieces it is . Subsequently, after taking out this test piece out of liquid, leaving it for 1 minute on the stainless steel wire of ten meshes and failing to drip surface liquid, the weight (W1) was measured. The value which *(ed) this weight by the weight (W0) before being immersed was made into water absorption and the oil-absorption scale factor.

Water absorption and oil-absorption scale-factor = W1/W0. [0034]

[Table 1]

表-1 市販品の縦横比

品名		ワークホース	サクセルウエス
品番		J300	100-480
単位		十倍キンパリー (株)	新王子製紙 (株)
縦横比		98.9	100.7
縦横比	縦 縦	3.2	3.2
	横 横	1.4	0.7
	縦横比	2.3	4.7
	縦横比	26.4	36.2
伸び率	縦 縦	68.2	87.8
	横 横	68.2	87.8
	縦横比	0.4	0.5
	縦横比	0.4	0.5

[Table 2]

表-2

品名		縦横比1	縦横比2	比較例1	比較例3	比較例4	比較例2
単位		縦横比	縦横比	縦横比	縦横比	縦横比	縦横比
縦横比	縦 縦	121.8	114.1	96.7	58.4	55.2	47.0
	横 横	418	418	409	218	208	188
	縦横比	0.29	0.28	0.24	0.27	0.27	0.25
	縦横比	8.0	8.0	8.4	2.8	2.7	3.2
伸び率	縦 縦	4.2	3.7	2.7	3.2	2.8	2.8
	横 横	1.4	1.8	2.4	0.0	0.9	1.2
	縦横比	68.2	58.2	31.8	65.5	58.3	30.7
	縦横比	78.6	70.1	66.7	70.1	71.1	75.9
吸水率	縦 縦	0.87	0.83	0.47	0.83	0.82	0.41
	横 横	2.2	1.8	1.8	1.5	1.4	0.9
	縦横比	4.0	4.1	4.4	0.7	0.6	0.8
	縦横比	8分45秒	5分22秒	5分12秒	3分49秒	2分42秒	1分56秒
クランク回	縦 縦	3.2	3.5	4.0	5.1	5.2	5.0
	横 横	9.01	9.28	01.2	0.74	2.01	8.85
	縦横比	8.14	12.10	16.0	0.69	0.88	1.18
	縦横比	Q	Δ	×	○	Q	×

[0035]

[Effect of the Invention] Examples 1 and 2 and the example 1 of comparison are basis-weight about 95 g/m2. The effect of crepe processing is shown using the compound sheet. The aspect ratio of the pace of expansion of the example 1 of comparison which is not carrying out crepe processing is 0.5, and is equivalent to the commercial wiper made of a span race nonwoven fabric. Although an example 1 carries out crepe processing of this sheet, an aspect ratio is set to 0.9 and the anisotropy is very low. Workability with 68.2% and width good [the pace of expansion itself / length / intense wiping work] at very as high a value as 78.6% is acquired. The improvement also with the extensive Clark rigidity which is the index of ductility and flexibility is accepted, and the wiper made of cloth is approached also in tactile feeling. Although this example was not using any chemicals, such as a softening agent, flexibility good in this way was acquired. The water absorption and oil-absorption nature showing a wiper performance are before and after crepe processing, and hardly changes, but it turns out that it has not had the bad influence on a basic performance.

[0036] Examples 3 and 4 and the example 2 of comparison show the effect of crepe processing using the compound sheet of a low basis weight (about 50 g/m2). Also in this case, a good effect as well as a precedent is accepted. It is effective for especially an improvement of flexibility, and a feel is the same level as a knitted fabric waste.

[0037] Although flexibility will also fall if compressibility is lowered and the grade of crepe processing is reduced so that examples 2 and 4 may see, if a pace of expansion is secured enough, it will be convenient to wiping.

[0038] Thus, since it excels in a feeling of a drape, and it has a feel very near the product made of cloth and sufficient elongation is given, maintaining the property which was [low cost / coexistence of water absorption and oil-absorption nature, the high wet strength,] excellent, the compound sheet which consists of a span bond nonwoven fabric obtained by this invention and pulp fiber can be used in comfort also by intense wiping work.

[Translation done]